PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : C23C 14/00 — A1

(11) International Publication Number: WO 98/31845

(43) International Publication Date: 23 July 1998 (23.07.98)

(21) International Application Number: PCT/US98/00861

(22) International Filing Date: 16 January 1998 (16.01.98)

(30) Priority Data:
08/783,880 16 January 1997 (16.01.97) US

(71) Applicant: BOTTOMFIELD, Layne, F. [US/US]; 3013 Blue Sky Place, Round Rock, TX 78664 (US).

(71)(72) Applicant and Inventor: BOTTOMFIELD, Roger, L. [US/US]; 1461 West Tara Drive, Gilbert, AZ 85233 (US).

(74) Agent: LIN, Steven; Law Offices of Steven Lin, Suite 1200, 3003 North Central Avenue, Phoenix, AZ 85012 (US).

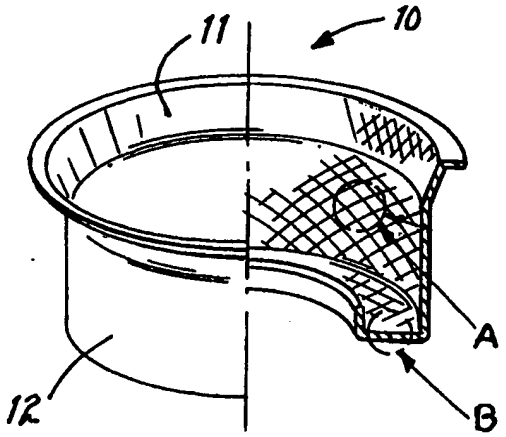
(81) Designated States: DE, GB, JP, KR, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: VAPOR DEPOSITION COMPONENTS AND CORRESPONDING METHODS

(57) Abstract

Vapor deposition chamber components, such as sputtering shield (10) and retaining ring (4), having a textured surface to anchor, capture, and/or secure collected sputtered metal wherein the textured surface is defined as a surface with features such as a plurality of projections, cavities, channels or grooves, partitions, or combinations thereof or equivalents. In one embodiment of the present invention, a sputtering shield (10) has a textured surface which includes features such as a plurality of upwardly directed projections (15) with boundary side walls (16) attached to the inner surface (11). The boundary side walls (16) of the projections (15) are not perpendicular to the inner side (11) of the sputtering shield (10), but preferably form an acute angle to the inner side (11), thus forming under–cuts (17) in the projections (15). The under–cuts (17) aid in the retention of sputtered material on the inner side (11) of the sputtering shield (10). Preferably, all of the surface features may have any shape, such as a shape with at least three vertices. In a second embodiment of the present invention, the retaining ring (4), which also collects sputtered metals capable of producing microcontaminants, has textured surface features as described above. However, the present invention is not limited to being used with any particular vapor deposition chamber component or within any particular vapor deposition chamber system, and the present invention may be used with any suitable vapor deposition chamber component or within any suitable vapor deposition chamber system.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

VAPOR DEPOSITION COMPONENTS AND CORRESPONDING METHODS

FIELD OF THE INVENTION

The present invention relates generally to components that are used in a vapor deposition chamber, and, more particularly, to shields and retainer rings with features that greatly reduce the amount of contaminants produced by delamination or exfoliation of sputtered material from such shields and retainer rings.

BACKGROUND OF THE INVENTION

The need to have a clean environment for manufacturing processes in many different industries is well known. The clean environment is especially important when the manufacturing process involves the application of thin film materials, which, in many instances, have thicknesses on the same order as microcontaminants. In these cases, microcontaminants affect the properties of the thin film materials. Therefore, the existence of microcontaminants is a significant problem in these processes.

One method for depositing thin films is to place a substrate or wafer in an evacuated chamber and bombard a target material with gaseous ions. The gaseous ions dislodge atoms from the target material in the direction of the substrate or wafer. The sputtered material then adheres to the substrate or surroundings. This process is known as sputtering, which is one form of physical vapor deposition (PVD). When metals are sputtered onto a substrate or wafer, some of the sputtered metal collects onto the chamber walls. Since most chamber walls are planar and continuous, stresses in the collected sputtered metal builds rapidly across the entire surface until the stresses reach a critical point. The sputtered metal then releases stress by buckling from the adhered to surface(s), thus causing small pieces of sputtered metal to be released into the vapor deposition chamber. These microcontaminants then reach the substrate or wafer being sputter coated and can significantly affect the properties of the thin film.

In order to reduce the amount of sputtered material from reaching the vapor deposition chamber walls, a sputtering shield is placed around the substrate or wafer. Furthermore, a retaining ring is sometimes used to hold the wafer in place within the vapor deposition

chamber. These components only reduce the microcontamination problem since the sputtered metal collected on the shield or retaining ring will also eventually buckle or delaminate, thereby contaminating the chamber and/or the wafer. Therefore, there is a need for improved vapor deposition chamber components which inhibit or prevent the formation of microcontaminants in a vapor deposition chamber.

Many attempts have been made to create vapor deposition chamber components which reduce or eliminate this exfoliation or buckling of sputtered materials. One method of reducing microcontamination is to create a random and micro-rough surface on the vapor deposition component(s). One example of such a component is a sputtering shield that is disclosed in U.S. Patent No. 5,202,008, by Talieh et al. ("Talieh") wherein the sputtering shield is bead blasted and sputter etched clean to create a micro-rough surface for adhesion of sputtered material. The micro-rough surface may allow an increase in nucleation sites which should minimize the formation of interface voids, thereby reducing the amount of microcontaminants. Another example of a sputtering shield is disclosed in U.S. Patent No. 5,391,275, by Mintz ("Mintz"), in which the sputtering shield and clamping ring are bead blasted, ultrasonically cleaned, and, either: 1) sputter etched cleaned; 2) plasma reactively cleaned; or 3) plasma nonreactively cleaned. These processes create the same rough surface as taught in the Talieh patent. It is even known that attaching a layer of microcrystalline alumina (Aluminum Oxide, Al_2O_3) on the surface of a sputtering shield helps reduce the microcontaminants. The micro-roughening of the surfaces of these components reduces the amount of microcontamination within a vapor deposition chamber, but there is still a need for further reduction of these microcontamination amounts.

Another method for reducing microcontaminants is to paste or coat the sputtered material onto the surface of the vapor deposition components. An example of such a method is disclosed in U.S. Patent No. 5,382,339 by Aranovich ("Aranovich"). Aranovich teaches the pasting of previously deposited material onto the surface by sputtering a material such as aluminum or titanium on top of the previously deposited material. This pasting holds the potential exfoliants to the surface and prevents buckling. However, this pasting, which is equivalent to lacquering, merely adds another layer of material on top of the potential exfoliant

which could also buckle as well. Furthermore, this method of pasting or coating increases the complexity of the process, and, while helpful, it is not a final solution to the problem.

These methods and devices serve to reduce the problem of stray particulates in the clean environment necessary for thin film deposition, but there remains a further need for vapor deposition chamber components which reduce, or even eliminate, the problem of exfoliation contamination.

SUMMARY OF THE INVENTION

Set forth is a brief summary of the invention in order to solve the foregoing problems and achieve the foregoing and other objects, benefits, and advantages in accordance with the purposes of the present invention as embodied and broadly described herein.

Accordingly, it is an object and advantage of the present invention to provide a method of making a vapor deposition chamber component surface that includes the step of selectively etching portions of the surface thereby creating a textured surface.

An aspect and advantage of the present invention is to provide a method of making a vapor deposition chamber component surface wherein the step of selectively etching portions of the surface further includes the steps of photolithographically forming patterns on the surface and etching the formed patterns into the surface.

It is another object and advantage of the present invention to provide a vapor deposition chamber component, such as a shield or retaining ring, that has a textured surface.

A further aspect and advantage of the present invention is to provide a vapor deposition chamber component wherein the textured surface is defined as a surface with features such as a plurality of projections, cavities, channels or grooves, partitions, or combinations thereof or equivalents.

It is a further object and advantage of the present invention to provide a method of using a vapor deposition chamber component with a textured surface that includes the steps of accumulating sputtered material onto a vapor deposition chamber component and securing the sputtered material onto the vapor deposition chamber component with the textured surface.

It is an object of the present invention to provide vapor deposition chamber components which reduce the amount of microcontaminants in the vapor deposition chamber.

It is a further object of the present invention to provide vapor deposition chamber components which capture deposited material and lessens the possibility of exfoliation of the captured material.

It is yet a further object of the present invention to provide vapor deposition chamber components which utilize numerous projections, cavities, channels or grooves, partitions, or combinations thereof or equivalents on the surface(s) of the components to aid in the capture of deposited material.

It is still yet a further object of the present invention to provide vapor deposition chamber components which have projections, cavities, channels or grooves, partitions, or combinations thereof or equivalents with a variety of acute angles in order to prevent microcontamination of the clean environment of the vapor deposition chamber.

It is another object of the present invention to provide a method for manufacturing vapor deposition chamber components with numerous projections, cavities, channels or grooves, partitions, or combinations thereof or equivalents for the capture of deposited material in the vapor deposition chamber.

It is still yet another object of the present invention to provide a method for selectively etching portions of the vapor deposition chamber components, such as sputtering shields and retaining rings, with a textured surface which reduces the amount of microcontamination in the vapor deposition chamber.

It is still yet another object of the present invention to provide a method, such a acid etch lithography, in order to create multiple projections on vapor deposition chamber components, said projections used to affix layers of deposited material onto the surface of the vapor deposition chamber components.

BRIEF DESCRIPTION OF THE FIGURES

The novel features that are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its structure and its operation together with the additional object and advantages thereof will best be understood from the following description of the preferred embodiment of the present invention when read in conjunction with the accompanying drawings wherein:

FIG. 1 is a cross sectional side view of a vapor deposition chamber;

FIG. 2 is a quarter cut-away perspective view of an embodiment of a sputtering shield according to the present invention;

FIG. 3 is an expanded view of area A in Fig. 2 which shows the shape of the pattern of the features of the textured surface according to the present invention;

FIG. 4 is a partial cross sectional side view of area B in Fig. 2 illustrating the shape of the boundary side walls according to the present invention;

FIG. 5 is an exploded view of one embodiment of a vapor deposition chamber with a sputtering shield and retaining ring according to the present invention;

FIG. 6 is a partial cross sectional view of a retaining ring holding a wafer in place;

FIG. 7 is a quarter cut-away side view of another embodiment of the present invention;

FIG. 8 is a top view of the projections or cavities according to the present invention with a six pointed star outline;

FIG. 9 is a top view of the projections or cavities according to the present invention with a triangular outline;

FIG. 10 is a quarter cut-away side view of still another embodiment of the present invention;

FIG. 11 is a perspective view of another sputtering shield embodiment;

FIG. 12 is a partial cross-sectional view of the sputtering shield of Fig. 11 according to the line 12 - 12 of Fig. 11.

FIGS. 13 - 21 depict two embodiments of the etching method according to the present invention wherein these embodiments utilize photolithography to create a textured surface on vapor deposition chamber components;

FIG. 13 shows a metal surface on a vapor deposition chamber component;

FIG. 14 shows a photoresist applied onto the metal surface of Fig. 13;

FIG. 15 shows a mask placed over the photoresist, and non-masked portions are irradiated;

FIG. 16 shows the irradiated portions of the photoresist are removed with a first solvent,

FIG. 17 shows the exposed metal surface of the sputtering shield is etched away;

FIG. 18 shows the remaining portion of the photoresist is removed with a second solvent;

FIG. 19 shows an alternate embodiment wherein the non-irradiated portions of the photoresist in Fig 15 are first removed;

FIG. 20 shows the exposed metal surface of the sputtering shield is etched;

FIG. 21 shows the remaining irradiated portion of the photoresist is removed.

DETAILED DESCRIPTION OF THE INVENTION

Vapor deposition is generally performed in an evacuated sputtering chamber system **1**, as shown in Fig. 1, in which a substrate **2** is subjected to bombardment by sputtered atoms from a sputtering source **100**. The substrate **2**, typically a wafer, is placed upon a pedestal **3** and held in place with a retaining ring **4**. A sputtering shield **10** which protects the vapor deposition chamber walls **5** from excessive contamination by sputtered metals is located around the wafer **2**.

However, the present invention may be utilized for carrying out its purposes within any suitable system or method for the deposition of thin films on surfaces, and the present invention is not in any way limited to use within the vapor deposition system or apparatus shown or described in the figures or specification.

VAPOR DEPOSITION CHAMBER COMPONENTS

The vapor deposition chamber components of the present invention include, but are not limited to, the sputtering shield **10** and the retaining ring **4**. As shown in Figs. 1 and 2, the sputtering shield **10** of the present invention has two sides, an inner side **11** and an outer side **12**. The inner side **11** of the sputtering shield **10** has a textured surface to anchor, capture, and/or secure collected sputtered metal. A textured surface or contoured surface herein means a surface with features such as a plurality of projections, cavities, channels or grooves, partitions, or combinations thereof or equivalents.

In a first embodiment of the present invention, the sputtering shield **10** has a textured surface which include features such as a plurality of upwardly directed projections **15** with boundary side walls **16** attached to the inner surface **11**. See Fig. 4. Preferably, the projections **15** are integrally formed onto the inner side **11** of the sputtering shield **10.** Alternately, the projections **15** may be attached by welding or any other suitable ways of attachment.

The boundary side walls **16** of the projections **15** or the cavities **14** are not perpendicular to the inner side **11** of the sputtering shield **10**, but preferably form an acute angle to the inner side **11**, thus forming under-cuts **17** in the projections **15** or in the cavities **14**. The under-cuts **17** aid in the retention of sputtered material on the inner side **11** of the sputtering shield **10**. Preferably, all of the textured surface features of the present invention have under-cuts **17**. These characteristics of the textured surface features are illustrated in Fig 4, which is a partial sectional view of two types of features, a single projection **15** and a single cavity **14**.

The textured surface features may be of any shape, which includes but is not limited to a shape such as one with at least three vertices, but it is preferred that the shape be a five pointed star. Alternately, other shapes may be utilized, as seen in the six pointed star outline **18** of Figure 8 and the triangular outline **19** of Figure 9. The vertices provide angular points or edges that also aid in the retention of sputtered material to the surface of the vapor deposition component. The present invention, however, is not limited to those shapes described herein.

The concentration of textured surface features is indicative of the performance of the present invention. The ratio by which this concentration is measured is solidity. Solidity is defined as the amount of non-elevated textured surface area divided by the total textured surface area, e.g., a smooth surface would have a ratio of 1 and an infinitely textured surface would approach 0. The present invention works most effectively with a solidity between 0.5 and 0.95.

In a second embodiment of the present invention, the retaining ring **4**, which also collects sputtered metals capable of producing microcontaminants, has textured surface features as described earlier in this specification. As on the sputtering shield **10**, the textured surface features, such as the plurality of projections **15** (see Fig. 6), are attached to a side of the retaining ring **4** which faces the sputtering source **100** and the sputtered metal is then anchored, captured, and/or secured by the textured surface features. See Fig. 5.

However, any suitable vapor deposition component configuration or geometry may be utilized for carrying out the purposes of the present invention, which is not limited to those shown in the figures above. For example, Figures 7, 10 and 11 show different sputtering textured or contoured surface shield configurations **10A**, **10B**, and **10C** which embody the present invention.

Furthermore, the projections, cavities, channels or grooves, partitions, or combinations thereof or equivalents can be made to be of any height or depth, which includes but is not limited to the preferred height or depth of fifteen (15) mil. Additionally, other technologies, such as bead blasting, coating, or other prior art methods or apparatus, can be used in conjunction with the present invention to further reduce or eliminate exfoliotion or contamination problems associated with vapor deposition chambers or processes.

METHODS OF MAKING THE PRESENT INVENTION

The present invention presents novel methods for making vapor deposition component surfaces which inhibit or prevent the formation of microcontaminants within the vapor deposition chamber.

One method for making vapor deposition component surfaces according to the present invention is to etch selected portions of the surface of the vapor deposition component to form

a textured surface. More particularly, the present invention contemplate the selective etching of surfaces of retaining rings **4** and sputtering shields **15**. Furthermore, the surfaces of these components are etched so that the textured surface features such as projections, cavities, channels or grooves, partitions, or combinations thereof physically and/or visibly exist on the surface of the vapor deposition component (i.e. the present invention teaches or suggests selective roughening of the surface on a relatively macroscopic level compared with some of the prior art that discloses or teaches the random and micro-roughening of the surface using a method such as bead blasting, etc.).

One method for etching surfaces **20** (i.e. including but not limited to metal surfaces) uses photolithography to form patterns on the surfaces **20**. These patterns are formed by taking a clean vapor deposition chamber component, such as sputtering shield **10** or retaining ring **4**, having the surface **20** to be treated (Fig. 13) and applying a photoresist **30** to the surface **20** (Fig. 14). A photoresist is a material which changes structure when irradiated such that different solvents are needed to dissolve irradiated portions than non-irradiated portions. A mask **31** is then placed over the photoresist **30** and non-masked portions **32** are irradiated (Fig. 15). The irradiated portions **32** of the photoresist **30** are then removed with a first solvent thereby exposing selected portions of the surface **20** (Fig. 16) which is then etched (Fig. 17). This etching may be done by suitable means such as plasma etching, but in the present invention, it is preferred that the etching be done with an acid capable of dissolving the surface **20** metal. Finally, the remaining non-irradiated portions **33** of the photoresist **30** are dissolved with a second solvent (Fig. 18). Additional cleaning according to normal industry practice, such as ultrasonic cleaning, may be performed to place the vapor deposition chamber components into condition for use.

Etching the metal surface **20** of the vapor deposition chamber components creates the textured surface with features having a boundary side wall **16** with an under-cut area **17**. The boundary side walls of the features are formed at an acute angle to the surface **20**.

Another photolithographic method for etching surfaces **20** takes a clean vapor deposition chamber component, such as sputtering shield **10** or retaining ring **4**, having a surface **20** to be treated (Fig. 13) and applying a photoresist **30** to the surface **20** (Fig. 14). A

mask **31** is then placed over the photoresist **30** and non-masked portions **32** are irradiated (Fig. 15). The non-irradiated portions **33** of the photoresist **30** are then removed with the second solvent (Fig. 19) and the exposed metal of the sputtering shield **10** is then etched (Fig. 20). Finally, the remaining irradiated portions **32** of the photoresist are removed with the first solvent (Fig. 21). Additional cleaning according to normal industry practice, such as ultrasonic cleaning, may be performed to place the vapor deposition chamber components into condition for use.

The result of these photolithographic processes is a vapor deposition chamber component with a textured surface which inhibits the formation of microcontaminants in a vapor deposition chamber system **1**. It is within the scope of the present invention to utilize any suitable or equivalent etching method for making the textured surfaces of the present invention and is not limited to those disclosed or shown in the figures.

While etching methods for creating textured surfaces of the present invention are described above, textured surfaces may also be produced by other methods. One such method is to take a metal piece such as a pre-stamped metal plate, and hot pressing or rolling a die onto the surface of the plate thereby forming a texture on the surface. The textured plate is then formed into a suitable configuration for a vapor deposition chamber component. The vapor deposition chamber component can be made by forming several pieces which are attached together. See Fig. 7 and Fig. 10. However, any other suitable method for creating textured surfaces is considered within the scope of the present invention, and the present invention is not limited to the methods disclosed or shown in the figures.

The preferred embodiment of the invention is described above in the Figures and Detailed Description. Unless specifically noted, it is the intention of the inventors that the words and phrases in the specification and claims be given the ordinary and accustomed meanings to those of ordinary skill in the applicable art(s). The foregoing description of preferred embodiments and best mode of the invention known to applicant at the time of filing the application has been presented for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and many modifications and variations are possible in the light of the above teaching. The embodiments

were chosen and described in order to best explain the principles of the invention and its practical application, and to enable others skilled in the art to best utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated.

Likewise, any use of the words "function" or "means" in the Detailed Description is not intended to indicate a desire to invoke the special provisions of 35 U.S.C. Sec. 112, Paragraph 6 to define his invention. To the contrary, if the provisions of 35 U.S.C. Sec. 112, Paragraph 6 are sought to be invoked to define the invention, the claims will specifically state the phrases "means for" or "step for" and a function, without reciting in such phrases any structure, material, or act in support of the function. Even when the claims recite a "means for" or "step for" performing a function, if they also recite any structure, material, or acts in support of that means or step, then the invention is not to invoke the provisions of 35 U.S.C. Sec. 112, Paragraph 6. Moreover, even if the inventors invoke the provisions of 35 U.S.C. Sec. 112, Paragraph 6 to define the invention, it is the intention that the invention not be limited only to the specific structure, material, or acts that are described in his preferred embodiment. Rather, if the claims specifically invoke the provisions of 35 U.S.C. Sec. 112, Paragraph 6, it is nonetheless the intention to cover and include any and all structures, materials, or acts that perform the claimed function, along with any and all known or later developed equivalent structures, materials, or acts for performing the claimed function.

The inventions described herein are not to be limited to the specific algorithms, methods, or steps disclosed in the preferred embodiment, but rather, are intended to be used with any and all such methods, algorithms, or steps. In its preferred form, applicant divides the method for etching surfaces into several steps. However, with appropriate knowledge and application of that knowledge to those of ordinary skill in the art, some of the steps can be implemented into a single step. Likewise, applicant divides the method of hot pressing or rolling texture onto surfaces into several steps However, with appropriate knowledge and application of that knowledge to those of ordinary skill in the art, some of the steps can be implemented into a single step. Thus, it is not the intention to limit the invention to any particular form or any number of method steps or to any specific procedural arrangement.

What is claimed is:

1. A method of making a vapor deposition chamber component surface characterized by the step of:

selectively etching portions of the surface thereby creating a textured surface.

2. The method of claim 1 wherein the step of selectively etching portions of the surface is further characterized by the steps of:

photolithographically forming patterns on the surface, and

etching the formed patterns into the surface.

3. The method of claim 2 wherein the steps of photolithographically forming patterns on the surface and etching the formed patterns into the surface further comprise the steps of:

applying a layer of photoresist material to the surface;

placing a mask above the layer of photoresist material;

irradiating at least one nonmasked portion of the photoresist material;

removing the at least one irradiated portion of the photoresist material thereby exposing at least one underlying surface;

etching the at least one underlying surface; and

removing any remaining portions of the photoresist material.

4. The method of claim 1 wherein the textured surface is further characterized by a plurality of projections.

5. The method of claim 4 wherein the projections on the textured surface are further characterized by a shape with at least three vertices.

6. The method of claim 5 wherein the shape of the projections is further characterized by a five pointed star.

7. The method of claim 1 wherein the textured surface is further characterized by under-cut boundary side walls.

8. The method of claim 2 wherein the steps of photolithographically forming patterns on the surface and etching the formed patterns into the surface further comprise the steps of:

applying a layer of photoresist material to the surface;

placing a mask above the layer of photoresist material;

irradiating at least one nonmasked portion of the photoresist material;

removing any non-irradiated portion of the photoresist material thereby exposing at least one underlying surface;

etching the at least one underlying surface; and

removing any remaining portions of the photoresist material.

9. A vapor deposition chamber component characterized by a component with a textured surface.

10. The vapor deposition chamber component of claim 9 wherein the component is a vapor deposition sputtering shield.

11. The vapor deposition chamber component of claim 9 wherein the component is a vapor deposition retaining ring.

12. The vapor deposition chamber component of claim 9 wherein the textured surface is further characterized by a plurality of projections attached to the component.

13. The vapor deposition chamber component of claim 9 wherein the textured surface is further characterized by a plurality of cavities in the component.

14. The vapor deposition chamber component of claim 9 wherein the textured surface is further characterized by at least one channel in the component.

15. The vapor deposition chamber component of claim 9 wherein the textured surface is further characterized by at least one partition attached to the component.

16. The vapor deposition chamber component of claim 9 wherein the textured surface is further characterized by a combination of projections, cavities, channels, and partitions.

17. The vapor deposition chamber component of claim 12 wherein each of the projections is characterized by at least three vertices.

18. The vapor deposition chamber component of claim 12 wherein each of the projections is characterized by a five pointed star outline.

19. The vapor deposition chamber component of claim 9 wherein the textured surface is characterized by undercut sides.

20. A method of using a vapor deposition chamber component with a textured surface having the step of:

accumulating sputtered material onto a vapor deposition chamber component; characterized by the step of:

securing the sputtered material onto the vapor deposition chamber component with the textured surface.

21. The method of claim 20 wherein the securing step is further characterized by the step of securing the sputtered material onto the vapor deposition chamber component with a surface having a plurality of projections with boundary side walls.

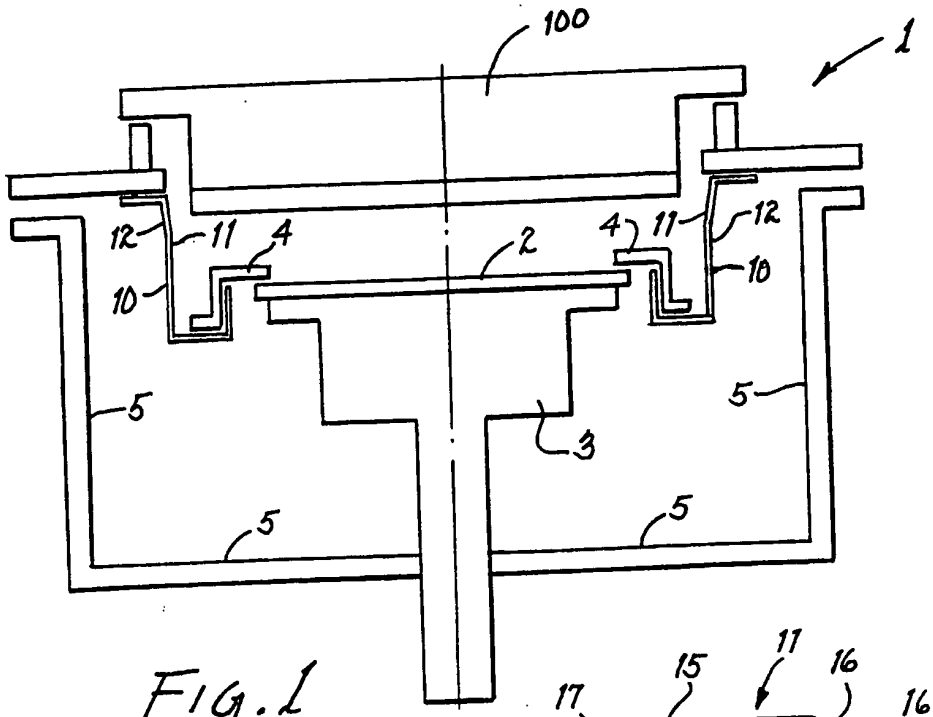


FIG. 1

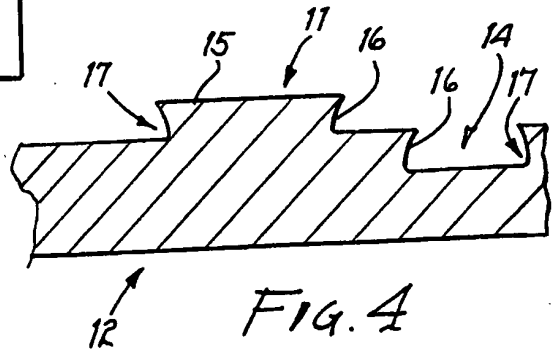


FIG. 4

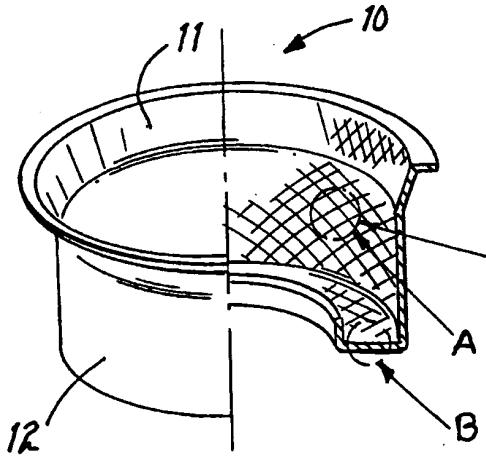


FIG. 2

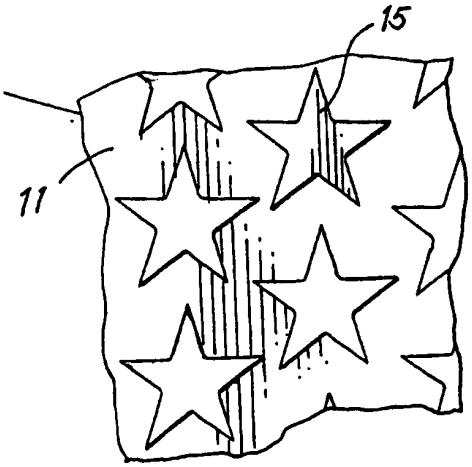


FIG. 3

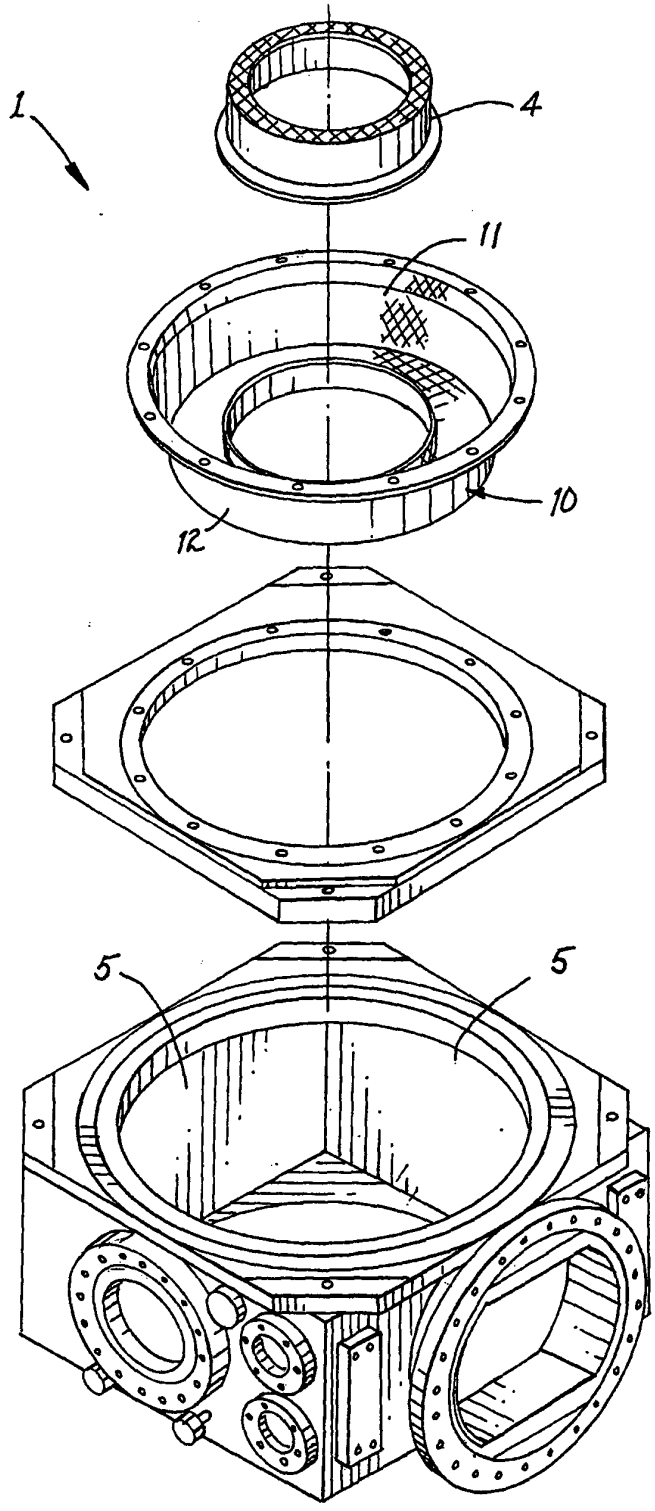


FIG. 5

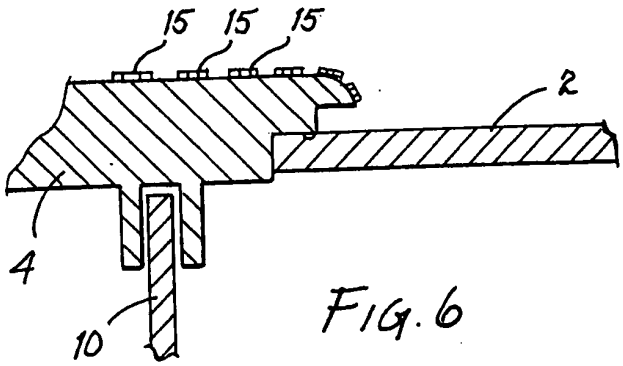


FIG. 6

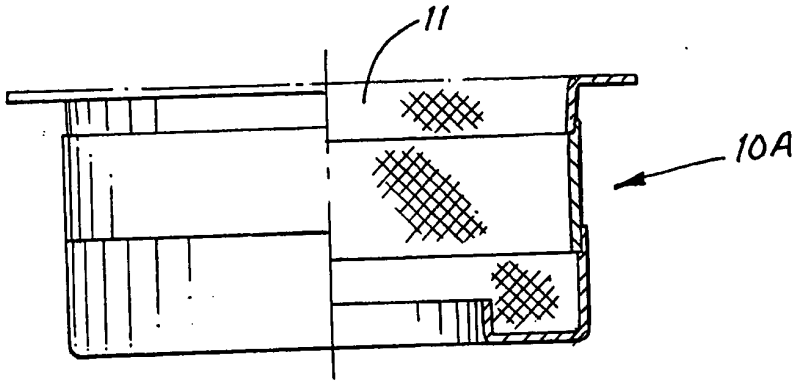


FIG. 7

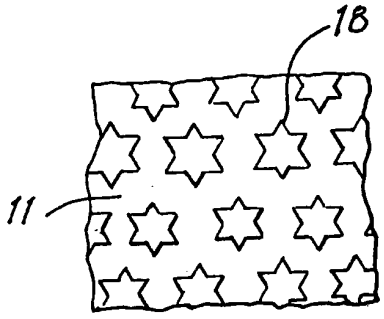


FIG. 8

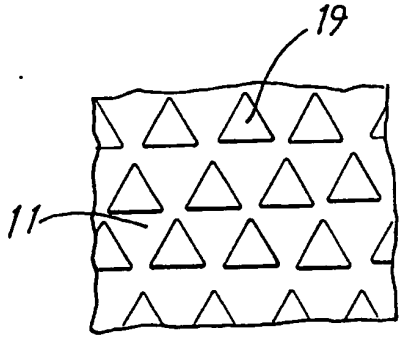


FIG. 9

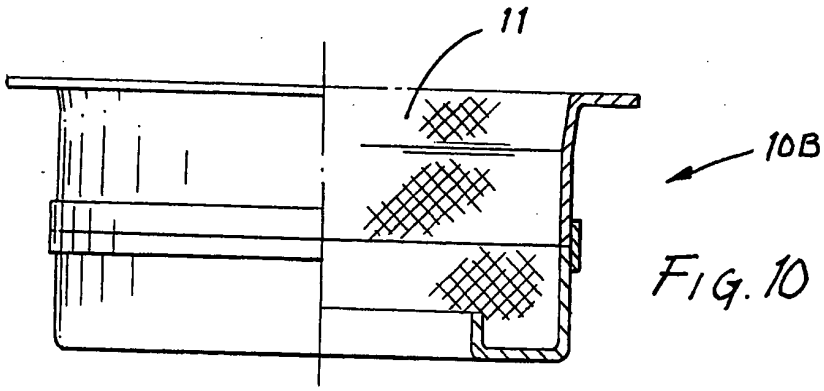


FIG. 10

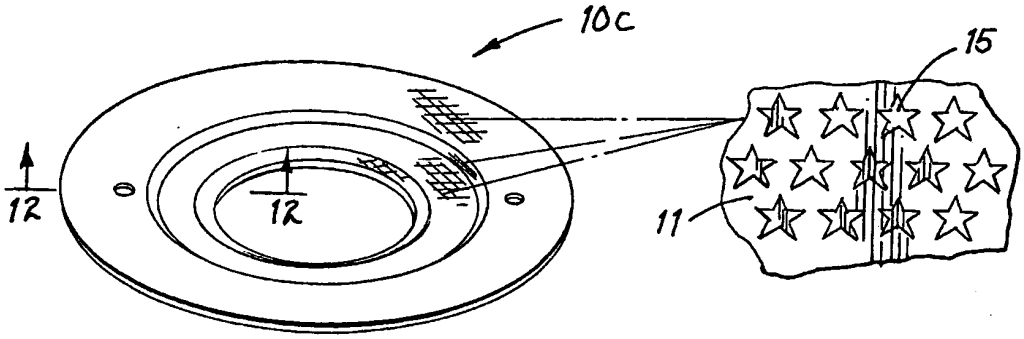


FIG. 11

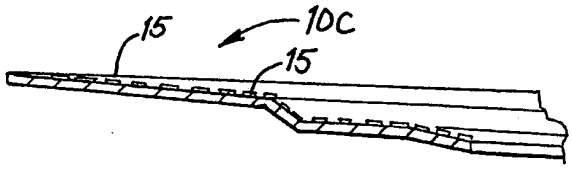


FIG. 12

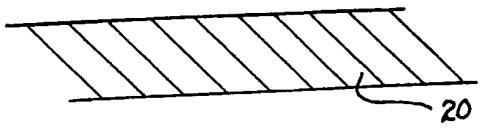


FIG. 13

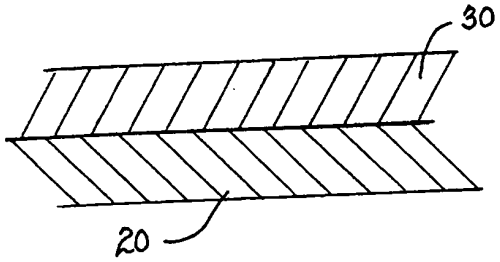


FIG. 14

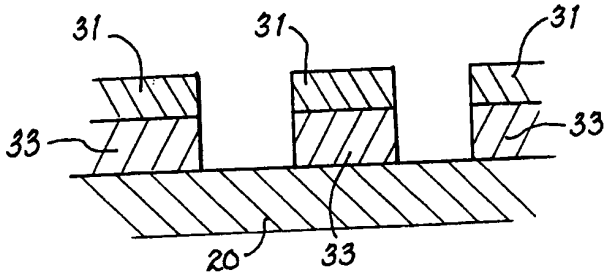


FIG. 16

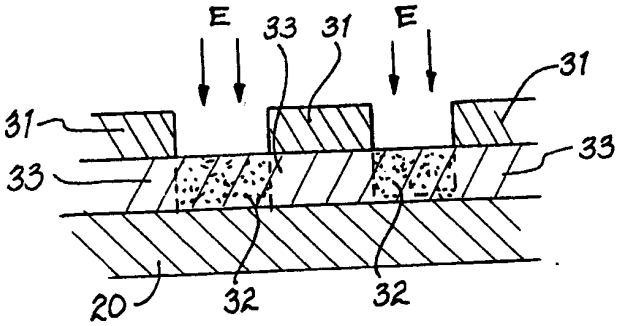


FIG. 15

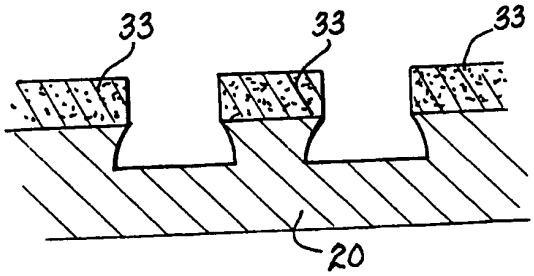


FIG. 17

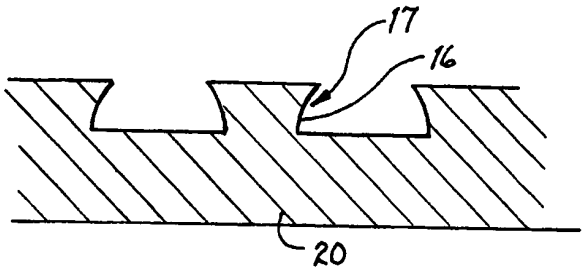


FIG. 18

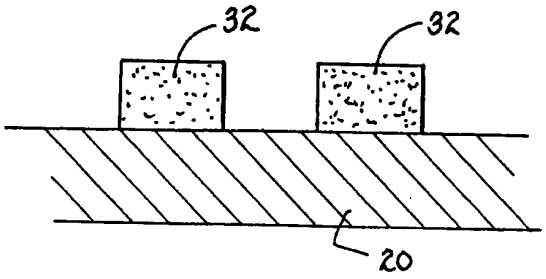


FIG. 19

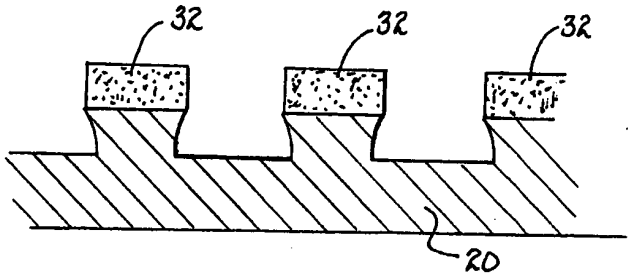


FIG. 20

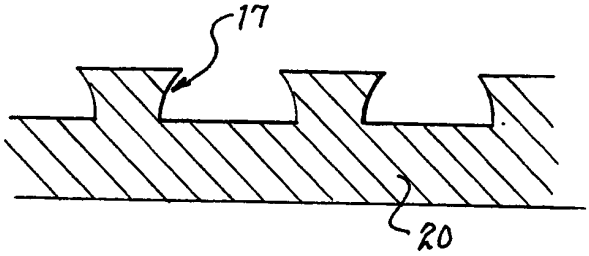


FIG. 21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/00861

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :C23C 14/00
US CL :216/11,49,52,56,58,83; 204/192.32,298.11,298.31
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 216/11,49,52,56,58,83; 204/192.32,298.11,298.31

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,391,275 A (MINTZ) 21 February 1995, abstract	9-11
Y,P	US 5,614,071 A (MAHVAN et al) 25 March 1997, column 3, lines 15-25,41-52, column 4, lines 20-25	1-21
Y	US 5,474,649 A (KAVA et al) 12 December 1995, column 3, lines 23-47, column 5, lines 45-46, 56-57	1-21
Y, P	US 5,653,891 A (OTSUKI et al) 05 August 1997, Fig.7A-7C	2,3,7,8,19
Y	US 5,482,612 A (ARMSTRONG et al) 09 January 1996, abstract	1-21

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
17 APRIL 1998	20 MAY 1998
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer ANITA ALANKO Telephone No. (703) 305-7708

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/00861

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P	US 5,637,199 A (LORENTZ et al) 10 June 1997, abstract	9-13